North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

THOROUGHFARE PLAN

FOR

1992

THOROUGHFARE PLAN

FOR

MOCKSVILLE, NORTH CAROLINA

Prepared by the:

Statewide Planning Branch
Division of Highways
N. C. Department of Transportation

In Cooperation with:

The Town of Mocksville
The Federal Highway Administration
U. S. Department of Transportation

February, 1992

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G MODLIN JR

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ACKNOWLEDGMENTS

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125 copies of this were printed at a cost of $212.57, or $1.70 per copy (G.S. 143-170.1).

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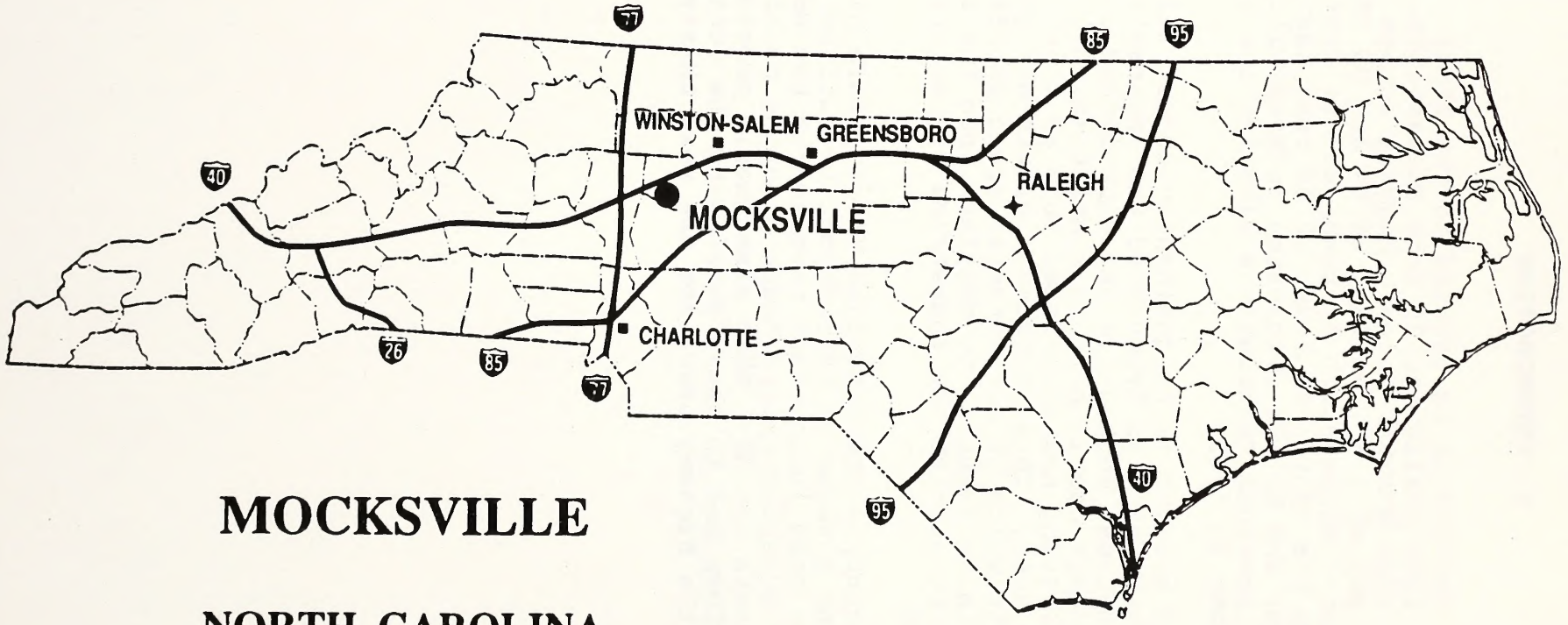
I. INTRODUCTION

The Town of Mocksville is located in the center of Davie County, 18 miles from Lexington, 26 from Statesville, 18 from Salisbury and 26 from Winston-Salem. Highway access to Mocksville is by way of I-40, US 601, US 64 and US 158. I-40 runs east and west 3 miles north of town; US 601 runs north and south through the center of town; US 64 runs east and west through town; and US 158 originates in Mocksville and heads north. The previous Thoroughfare Plan for the Town of Mocksville was done in 1981.

Mocksville's economy is predominantly industrial based with large employers such as Crown Wood and Ingersoll Rand. During the last decade, Mocksville has experienced economic and population growth due in part to annexation, but primarily by attracting new industries such as Crown Wood and Lee Jeans to the area. This industrial growth has generated additional traffic which is concentrated along US 158, US 601 and US 64. Growth is expected to continue into the 1990's as Mocksville works to attract new industries and existing industries expand.

For this reason, a comprehensive thoroughfare plan is needed. It is the purpose of this report to outline a thirty-year major road improvement program for the Mocksville area in light of accepted thoroughfare planning principles and projected growth trends. **This plan should provide guidance to the Town and to those developing the outlying areas regarding the highway needs for the next thirty years.**

GEOGRAPHIC LOCATION



MOCKSVILLE

NORTH CAROLINA

FIGURE 1

II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. providing for the orderly development of an adequate major street system as land development occurs,

2. reducing travel and transportation costs,

3. reducing the cost of major street improvements to the public through the coordination of the street system with private action,

4. enabling private interests to plan their actions, improvements, and development with full knowledge of public intent,

5. minimizing disruption and displacement of people and businesses through long range advance planning for major street improvements,

6. reducing environmental impacts, such as air pollution, resulting from transportation, and

7. increasing travel safety.

Thoroughfare planning objectives are achieved through both improving the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include street widening, intersections improvements, improving vertical and horizontal alignment, and eliminating roadside obstacles. For example widening of a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. This reduces the impedances to traffic flow caused by slow moving or turning vehicles and the adverse effects of horizontal and vertical alignments.

Operational ways to improve street capacity include:

1. Control of access -- a roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.

2. Parking removal -- Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

3. One-way operation -- The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

4. Reversible lane -- Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

5. Signal phasing and coordination -- Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

1. Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

2. Encourage the use of transit and bicycle modes.

3. Encourage industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will spread peak travel over a longer time period and thus reduce peak hour demand.

4. Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions -- traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property leads to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, or major thoroughfares.

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations of the streets could be served.

Local streets may be further classified as either residential, commercial, and/or industrial depending upon the type of land use which the serve.

Minor Thoroughfares are more important streets on the city system. They collect traffic from local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function that may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, their principle function is to carry traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area is the radial-loop system. It permits movement between various areas of the city within maximum directness. This system consists of several functional elements--radial streets, crosstown streets, loop system streets, and bypasses (Figure 1A).

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets which form a loop around the central business district. This system allows traffic moving from origins on

IDEALIZED THOROUGHFARE PLAN

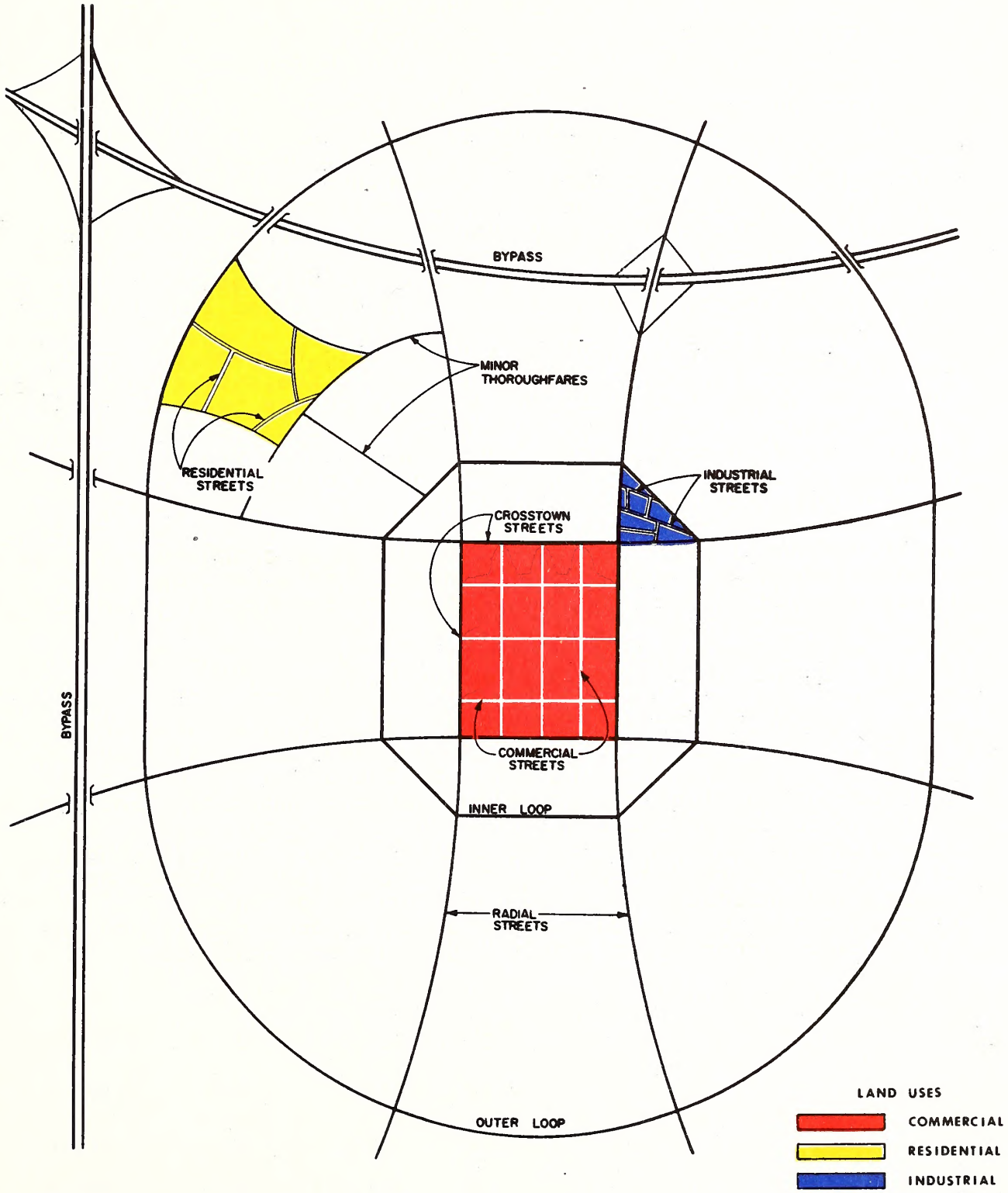


FIGURE 1A

one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic which has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, a thoroughfare plan is developed for established urban areas and is constrained by the existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these constraints and the many other factors that affect major street locations.

III. EXISTING FACILITIES

Major Routes

Mocksville is served primarily by I-40, which provides access east to Winston-Salem and west to Asheville. Major north-south routes include US 601 and US 158. US 601 links Mocksville, north to Yadkinville and south to Salisbury. US 158 runs north to Winston-Salem. The major east-west route is US 64 connecting Mocksville east to Lexington and west to Statesville.

Population Trends

Travel is directly related to population. The volume of traffic on any section of roadway is closely related to the size and distribution of the population which it serves. One of the basic steps in planning a transportation system is the population study. The purpose of the study is to enable the planner to forecast a reasonable and logical future population and its distribution. A close look at the past will give some indication as to what might be expected in the future.

As shown in Table 1, population growth in Mocksville has increased steadily since 1960 due to annexation and new industry locating here. Mocksville should continue to experience good population growth in the future due to its ability to attract new industry and its close location to several large metropolitan areas. Population projections for the Town of Mocksville were calculated by using the percent growth rates obtained from estimates made by the Office of State Budget and Management for Davie County. The resulting projection for the 2020 population of the Mocksville planning area is 7,150.

TABLE 1 - POPULATION TRENDS AND PROJECTIONS

Year	Mocksville	% Change	Mocksville Township	% Change	Davie County	% Change
1960	2,379	-	4,823	-	16,728	-
1970	2,529	6.31	5,702	18.23	18,855	12.72
1980	2,637	4.27	6,825	19.97	24,599	30.46
1990	3,400	28.93	7,014	2.77	27,859	13.25
2000[a]	3,942	3.96	7,950	13.34	31,083	11.57
2010[a]	4,572	3.95	9,010	13.33	33,470	7.68
2020[a]	5,300	3.98	10,212	13.34	35,228	5.25

[a].Estimates

Land Use

Some of the major industries in the Mocksville urban area are Crown Wood, Lee Jeans, Ingersoll Rand, Funder Wood Products, and Baker Furniture. Additional industrial development is expected to take place on the east side of Town, west of Bethel Church Road and south of Milling Road. Also, the area north of I-40 and west of US 601 is being targeted for industrial development by the Town.

Commercial development is concentrated along US 601, Wilkesboro Street, Salisbury Street, Gaither Street, and South Main Street in the form of small businesses, restaurants, and highway-oriented uses such as gas stations and convenient marts. Future commercial development will most likely continue along these corridors.

Residential growth has been steady in the Mocksville urban area and is directly related to industrial growth. Currently there is new home construction on the south side of town on East Lake Drive and in Garden Valley subdivision. There also is potential for additional growth on the north side of town between Wilkesboro Street and N. Main Street. Figure 2 shows a generalized land use plan of Mocksville.

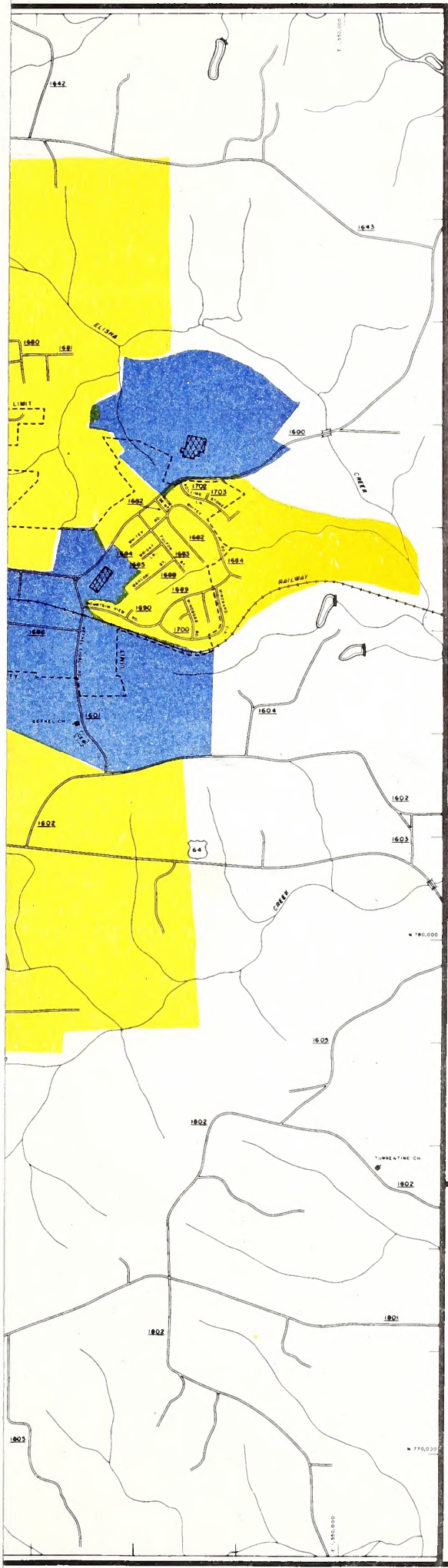
Travel Demand

Travel demand is generally reported in the form of average daily traffic volume. Traffic counts are taken regularly at several locations in and around Mocksville by the North Carolina Department of Transportation. To estimate future travel demand, traffic trends from 1960 to 1990 were studied. A comparison of annual growth rates shows average annual growth rates ranging from 1.8% to 11.8% at various count locations in the Mocksville Urban Area. The largest growth is found on US 64.

Figure 3 shows the 1991 Average Daily Traffic (ADT) volumes on state roads in the Mocksville Planning Area. It also shows traffic projections for the year 2020 based on growth rates of 2.0% (moderate growth) to 4.0% (high growth). The reason these rates were used instead of the historical growth rates is because these projections are being made for thirty years. It is very difficult for an area to sustain an annual growth rate over four percent. Likewise, it is uncommon for an area to maintain a growth rate less than two percent.

FIGURE 2

SIGNIFICANT LAND USE



LEGEND

- RESIDENTIAL
- PUBLIC
- COMMERCIAL
- INDUSTRIAL

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MOCKSVILLE

DAVIE COUNTY

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS – PLANNING AND RESEARCH BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

SCALE

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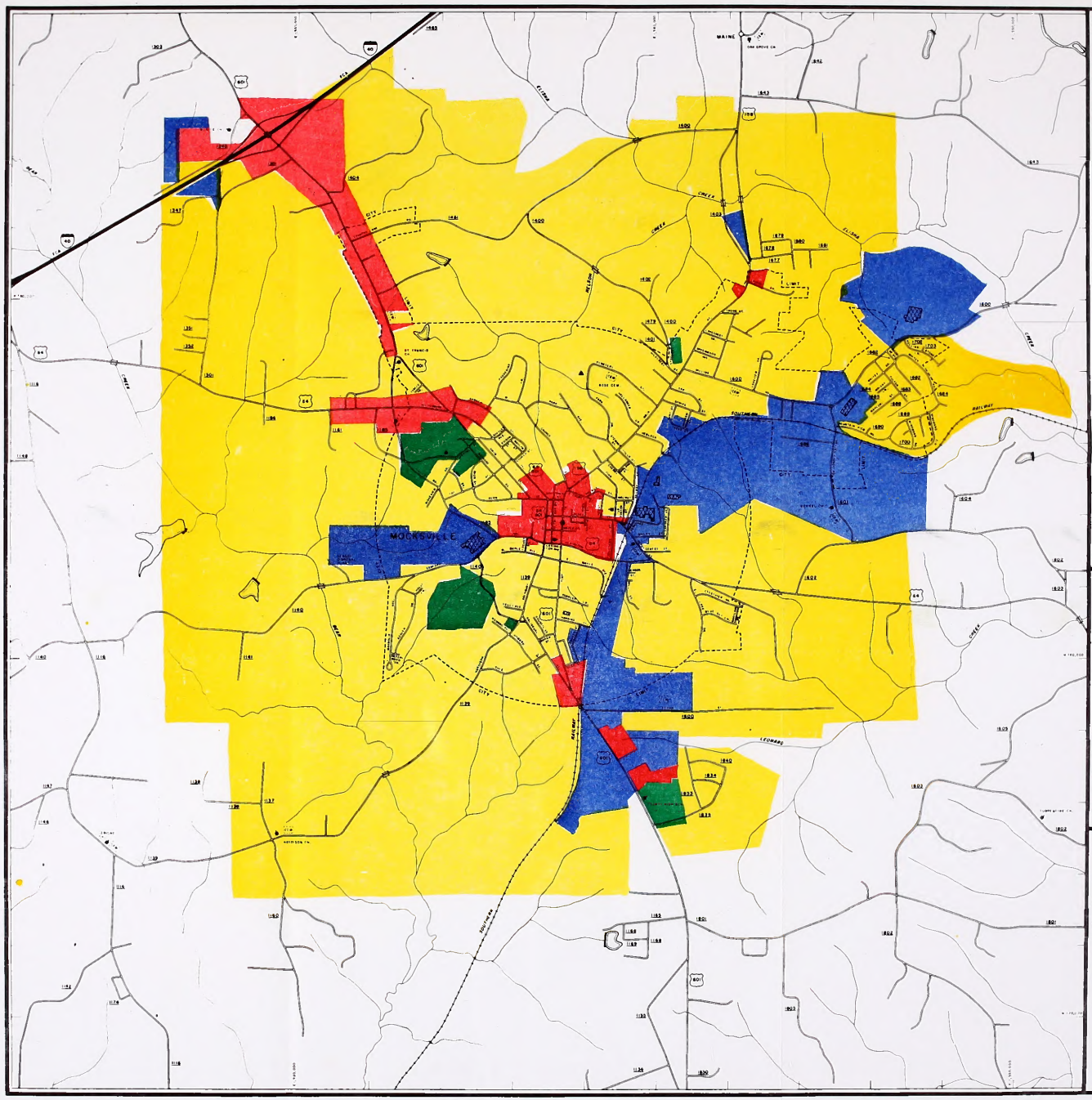

FIGURE 2

SIGNIFICANT LAND USE

LEGEND

RESIDENTIAL

PUBLIC

COMMERCIAL

INDUSTRIAL

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MOCKSVILLE

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SCALE

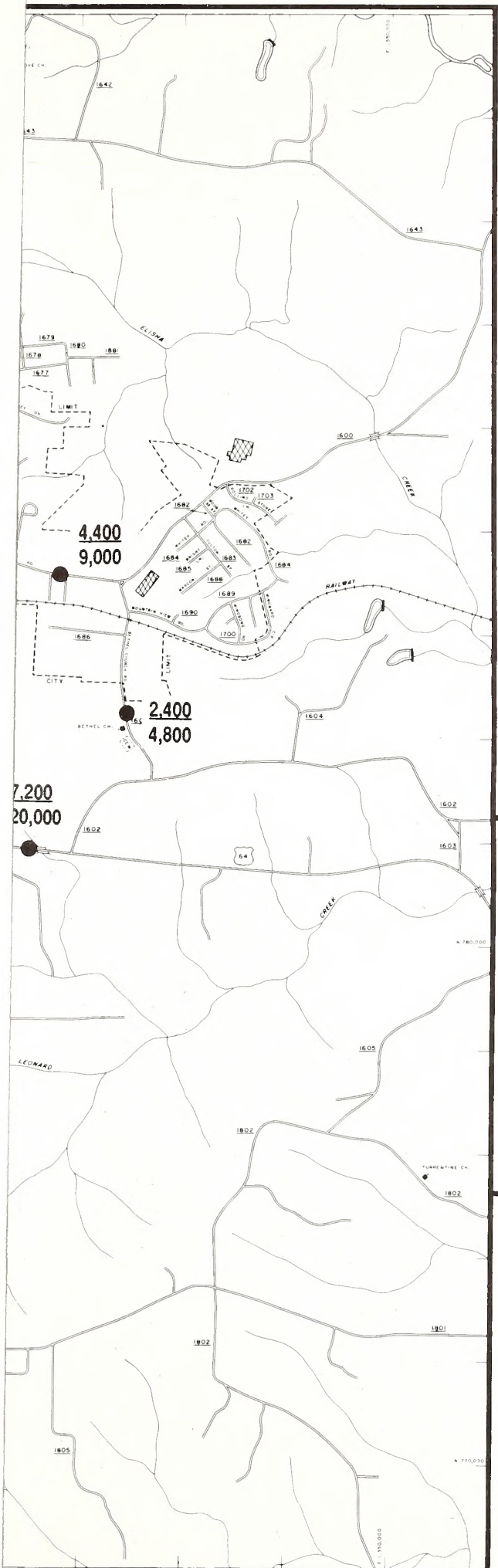

FIGURE 3

EXISTING AND PROJECTED ADTs

LEGEND

1990 EXISTING ADT
2020 PROJECTED ADT

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SCALE

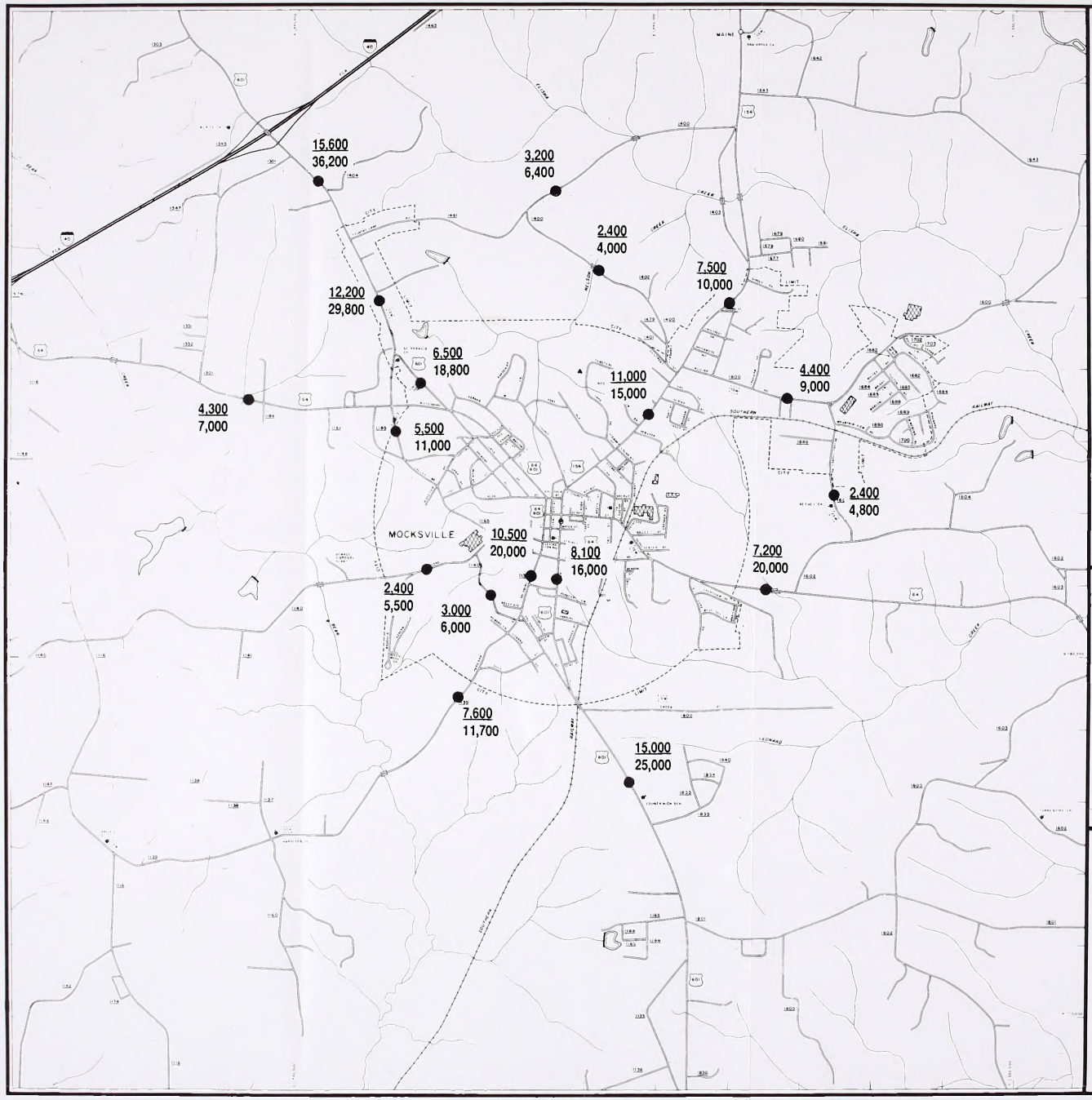

FIGURE 3

EXISTING AND PROJECTED ADTs

LEGEND

1990 EXISTING ADT
2020 PROJECTED ADT

N

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MOCKSVILLE

DAVIE COUNTY

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FEDERAL HIGHWAY ADMINISTRATION

SCALE

Capacity Analysis

A good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. Capacity is defined as the maximum amount of traffic that can be accommodated by a given facility. Six levels of service (LOS) are used to rate roadways. They are given letter designations from A to F with LOS A representing the best operating conditions and LOS F, the worst. Appendix A provides a detailed description of each level of service.

There are several locations in the Mocksville area that experienced capacity problems when 2020 traffic was distributed onto the existing street system. These areas are, US 601 (Wilkesboro and S. Main Streets), US 64 (Lexington Avenue), US 158 (North Main Street), Salisbury Street and Gaither Street. The primary problem is that these streets are radials and provide for traffic movement between points located on the outskirts of the Town and the central area. With all of these radial streets crossing in the central area, an intolerable congestion problem results. To eliminate this problem, Mocksville needs a system of cross-town streets that will form a loop around the central business district.

TABLE 2: TRAFFIC PROJECTIONS AND CAPACITIES FOR CRITICAL LINKS WITHOUT IMPROVEMENTS

ROAD	1991 ADT	2020 ADT	LOS D CAPACITY
US 601 (Wilkesboro Street)	6,500	18,880	12,000
Salisbury Street	10,500	20,000	12,000
US 64 (Lexington Avenue)	7,200	20,000	12,000
North Main Street	11,000	15,000	12,000
US 601 (South)	15,000	25,000	21,400

Traffic Accidents

Traffic accident analysis is a serious and important consideration in the development of a thoroughfare plan. The source of traffic accidents can be broken down into three general categories. The first is the physical environment, which includes such things as road condition, weather, road obstructions, and traffic conditions. The second source is associated with the driver. This includes the driver's mental alertness, distractions in the car, ability to handle the vehicle, and reaction time. The third source is associated with the physical attributes of the vehicle itself. This would include such things as the condition of the brakes and tires, vehicle responsiveness, size of the vehicle, and how well the windshield wipers and defroster work. All traffic accidents can be attributed to one or more of these sources; however, the driver is often the primary source.

Accident data from January 1986 through January 1991 was studied as part of the development of this report. The largest accident count for a single intersection in Mocksville was found at the intersection of US 601 and Salisbury Street with over forty accidents. Eight intersections in the Mocksville urban area had ten or more accidents (See Table 3).

TABLE 3 - SELECTED ACCIDENT INVENTORY
(January 1986 - January 1991)

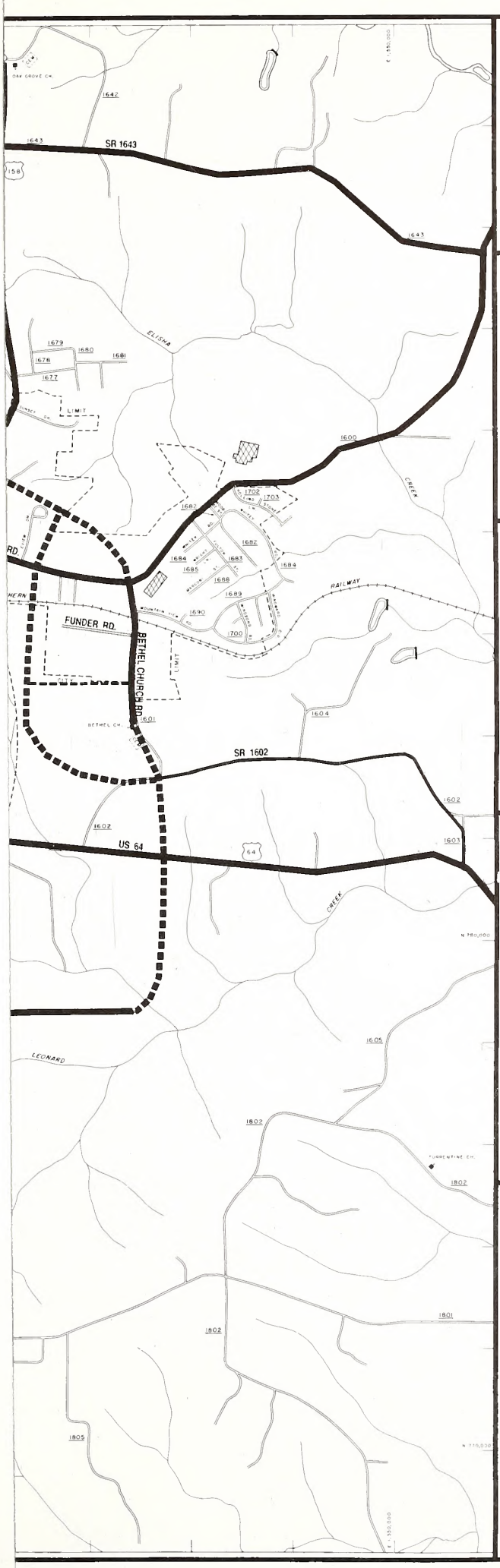
Location	Number of Accidents
Main and Salisbury Streets	41
US 601 and Country Lane	16
Depot and Salisbury Streets	16
US 601 and Valley Street	15
US 64 and Main Street	12
Gaithers and Main Streets	11
Lexington and Main Streets	11
Lexington and Salisbury Streets	10

IV. 1992 THOROUGHFARE PLAN RECOMMENDATIONS

The process of developing, testing and evaluating the recommended thoroughfare plan involved a number of considerations. These included Mocksville's goals and objectives, identified deficiencies, environmental impacts, existing and anticipated land development, and travel service. By studying past population growth and anticipated land use, a travel forecast can be developed for the design year. This travel forecast provides a basis for evaluating a proposed thoroughfare plans ability to serve future travel needs. Aerial photography, topographic mapping, field reconnaissance and discussion with local officials provided a basis for evaluating the feasibility of alternative alignments and the potential impacts.

There were several recommended revisions to the 1981 Thoroughfare Plan, map dated December 1, 1981 (See Figure 4A). These changes are discussed in greater detail in this chapter. Figure 4 shows the mutually adopted 1991 Mocksville Thoroughfare Plan, map dated February 4, 1992. Major revisions from the 1981 plan to the 1991 plan include:

1. relocating the extension of Bethel Church Road from the east end of Country Lane to Campbell Street,
2. the extension of Campbell Street to intersect with US 601 at Koontz Road (SR 1404),
3. the elimination of the Bethel Church Road extension from Eaton Street to Deadmon Road (SR 1801),
4. the relocation of the west end of Eaton Road approximately 0.25 miles south of its existing location,
5. the relocation of the US 601 bypass on the east side of Town from it intersection with Lakewood Sub-division (SR 1165) to the relocated west end of Eaton Road, and
6. the addition of an industrial access road from Milling Road to John Crotts Road (SR 1602).



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES		
FREEWAY	▬▬▬	▬ ▬ ▬
OTHER	▬▬▬	▬ ▬ ▬
MINOR THOROUGHFARES	———	- - -

REVISIONS

TOWN OF MOCKSVILLE	PLANNING AND ENVIRONMENTAL BRANCH	DEPARTMENT OF TRANSPORTATION

ADOPTED BY:

MOCKSVILLE FEBRUARY 4, 1992

STATEWIDE PLANNING BRANCH FEBRUARY 5, 1992 M.R. Poe

N.C. DEPARTMENT OF TRANSPORTATION

PUBLIC HEARING DATE FEBRUARY 4, 1992

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FIGURE 4

THOROUGHFARE PLAN

MOCKSVILLE

DAVIE COUNTY

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS – PLANNING AND RESEARCH BRANCH

IN COOPERATION WITH THE

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FEDERAL HIGHWAY ADMINISTRATION

SCALE

FEBRUARY 4, 1992

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES		
FREEWAY	▬▬▬	▬ ▬ ▬
OTHER	▬▬▬	▬ ▬ ▬
MINOR THOROUGHFARES	———	- - -

REVISIONS

TOWN OF MOCKSVILLE	PLANNING AND ENVIRONMENTAL BRANCH	DEPARTMENT OF TRANSPORTATION

ADOPTED BY:

MOCKSVILLE FEBRUARY 4, 1992

STATEWIDE PLANNING BRANCH FEBRUARY 5, 1992 MRR

N.C. DEPARTMENT OF TRANSPORTATION

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FIGURE 4

THOROUGHFARE PLAN

MOCKSVILLE

DAVIE COUNTY

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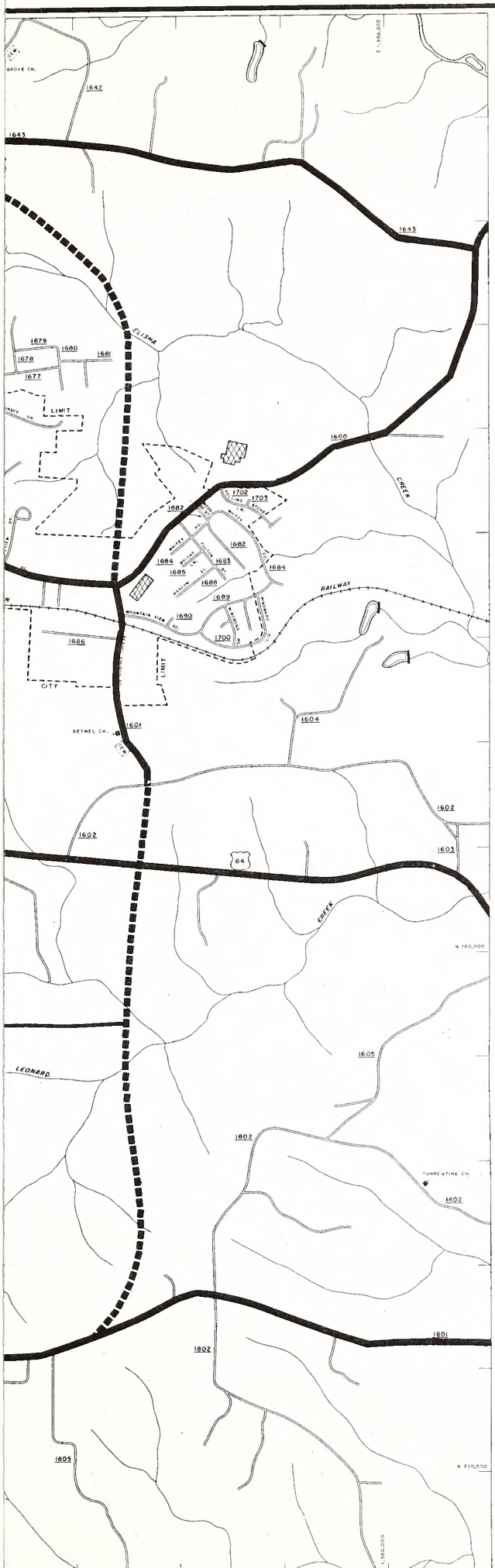
FEDERAL HIGHWAY ADMINISTRATION

SCALE

FEBRUARY 4, 1992



ADOPTED BY TOWN OF MOCKSVILLE
DECEMBER 14, 1981

RECOMMENDED APPROVAL BY
PLANNING & RESEARCH BRANCH
JANUARY 5, 1982
T L Waters

ADOPTED BY N.C. BOARD OF
TRANSPORTATION

MOCKSVILLE THOROUGHFARE PLAN

DECEMBER 1, 1981

LEGEND

	EXISTING	PROPOSED	LONG RANGE
MAJOR THOROUGHFARES			
FREEWAYS	▬▬▬	▬ ▬ ▬	▬▬▬
OTHER	▬▬▬	▬ ▬ ▬	▬▬▬
MINOR THOROUGHFARES	———	- - -	·····

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FIGURE 4A

MOCKSVILLE

DAVIE COUNTY

NORTH CAROLINA

PREPARED BY THE

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DIVISION OF HIGHWAYS – PLANNING AND RESEARCH BRANCH

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

0 1 2 3 4 5 6 7 8 9 1.0 MILE

0 1000 2000 FEET

ADOPTED BY TOWN OF MOCKSVILLE
DECEMBER 14, 1981

RECOMMENDED APPROVAL BY
PLANNING & RESEARCH BRANCH
JANUARY 5, 1982

ADOPTED BY N.C. BOARD OF
TRANSPORTATION

MOCKSVILLE THOROUGHFARE PLAN

DECEMBER 1, 1981

LEGEND

	EXISTING	PROPOSED	LONG RANGE
MAJOR THOROUGHFARES			
FREEWAYS			
OTHER			
MINOR THOROUGHFARES			

N

S

FIGURE 4A

MOCKSVILLE

DAVIE COUNTY

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS — PLANNING AND RESEARCH BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

Major Thoroughfare System

The Mocksville major thoroughfare system includes US 601, US 64, US 158, Sanford Avenue, Hardison Street, Milling Road, S. Main Street, Bethel Church Road, Sain Road (SR 1643), Valley Road, Gaithers Street, Eaton Street and Campbell Street. The function of each of these roads and recommended improvements will be discussed in this section. Typical thoroughfare cross-sections are shown in Appendix B. Appendix C summarizes the thoroughfare plan street tabulation and recommendations.

US 601 - This major thoroughfare serves as a radial route carrying north-south traffic through Mocksville. The major destination areas for this traffic are Yadkinville to the north, Statesville to the south, and businesses and industries located on US 601 in Mocksville.

The cross-section of existing US 601 varies as it passes through Mocksville. From I-40 to Koontz Road it is a five-lane 68-foot wide facility. From Koontz Road to Valley Road it becomes three lanes. From Valley Road through the central business district it is a two-lane 24-foot wide facility. At Eaton Street it returns to a three-lane facility until it reaches the Lee Jean Plant south of town. Approximately 15,000 vehicles per day currently use US 601. This volume is projected to increase to 36,200 vehicles per day north of town and 25,000 vehicles per day south of town by the year 2020 if current trends continue.

Currently the highest accident location in Mocksville exists on US 601 at the intersection of N. Main Street with Salisbury Street. These accidents are caused by the poor alignment of Salisbury Street, which restricts sight distance when merging onto Main Street. The realignment of Salisbury Street to form a right angle with Main Street would help to reduce accidents at this location.

Traffic projections show, that in the design year, US 601 will be over capacity from its intersection with US 64 to Gaither Street. The construction of a loop system on the north of Town could remove some of the traffic currently traveling from US 601/Wilkesboro Street to Gaithers Street and then to N. Main before accessing Milling Road.

US 158 (North Main Street) - This two-lane 24-foot wide roadway serves as a north-south radial route. Currently there are 11,000 vehicles daily using US 158. This is expected to increase to 15,000 vehicles per day by the year 2020. Some of Mocksvilles oldest and most historically significant homes are located along North Main Street.

This road can currently handle approximately 12,000 vehicles per day, which is insufficient for the design year traffic volume. However, the design year volume can be reduced by connecting Bethel Church Road to US 601 around north Mocksville (See Figure 4). This will remove traffic that would use North Main Street to access Milling Road thereby decreasing congestion.

Milling Road (SR 1600) - This two-lane 24-foot wide road serves as a local route connecting US 158 (N. Main Street) to industrial and residential developments in the Bethel Church Road area. Currently there are approximately 4,400 vehicles per day using the section of road between N. Main Street and Bethel Church Road. This is expected to increase to approximately 7,500 vehicles per day by the year 2020. Due to congestion that results when commuters travel to and from work, the Town of Mocksville is currently widening this section of road to three lanes. No additional improvement is recommended.

Bethel Church Road (SR 1601) - This two-lane 24-foot wide road serves the industrial area on the east side of Mocksville and connects Milling Road with John Crotts Road (SR 1602). It is expected that the area will continue to grow with current industries expanding and new industries being attracted to this location. It is recommended that Bethel Church Road be extended both north and south; to the south to intersect with US 64 and to the north to converge with Campbell Road, cross Country Lane and intersect with US 601 at Koontz Road. This will create a loop on the north side of Town that will provide improved access to existing and future industries.

US 64 (Lexington Avenue) - This 24-foot wide east-west two-lane radial roadway is currently used by 7,200 vehicles per day on the east side of town and 4,300 on the west side. Many of these vehicles are trucks traveling between Lexington and Statesville. Traffic volumes are expected to increase to 20,000 vehicles per day on the east side of Town by the year 2020 due to vehicles traveling from I-40 to the industrial area along Bethel Church Road. The extension of Bethel Church Road from US 64 to US 601 will provide an alternative route to access this area decreasing future traffic volumes to 12,800 along eastern US 64. If the extension of Bethel Church Road is not completed, US 64 will need to be widened to a three lane undivided facility on the east side of town.

Eaton Street - This local street is 18 feet wide and can carry 8,000 vehicles per day safely. The thoroughfare plan recommends that: existing Eaton Street be widened to 24 feet; that the east end be extended to the north to intersect with US 64 opposite the proposed extension of Bethel Church Road; and that the west end be relocated to the south to improve sight distance for vehicles turning onto US 601.

Salisbury Street - This two-lane 24-foot wide road serves as a north-south radial and has a capacity of 12,500 vehicles per day. Currently 10,500 vehicles per day use this facility. By the year 2020, without the improvements shown on the Thoroughfare Plan, average daily traffic will increase to 20,000 vehicles per day between Lexington Avenue and Hardison Street, requiring this section to be widened to three lanes. With the Thoroughfare Plan improvements, volumes are expected to increase to 12,500 vehicles per day and no improvements will be required.

Hardison Street - Currently this two-lane 24-foot wide roadway carries 7,600 vehicles per day and has a capacity of 13,000 vehicles per day. The volume of traffic on this route by year 2020 is expected to be 11,700 vehicles per day and no improvements are recommended.

Sanford Avenue - This east-west radial route is 24 feet wide and carries 2,400 vehicles per day. The design year volume is expected to be 5,500 vehicles per day; no improvements are recommended.

Valley Road - This three-lane 36-foot wide roadway serves as a crosstown facility on the west side of Mocksville. Currently this road is used by approximately 5,500 vehicles daily. By the year 2020, this is expected to increase to 11,000 vehicles per day. This route should not experience any traffic problems over the planning period and no improvements are recommended.

US 601 Bypass - It is proposed that the Bypass be a four-lane divided highway with a 46-foot median, 2-foot paved shoulders and 10-foot grassed shoulders. This facility will connect radial routes forming a crosstown loop facility for use by local traffic. It also, as a bypass, will remove through traffic from the Mocksville central business district. It is expected to carry 18,000 vehicles per day by the year 2020.

John Crotts Road Extension (SR 1602) - It is proposed that John Crotts Road be extended (See Figure 4) from its existing intersection with Bethel Church Road, northwest crossing Milling Road just east of Lakeview Drive, intersecting with the northern extension of Bethel Church Road. This proposed, two-lane 24-foot wide extension, will provide additional access to existing industries on Bethel Church Road and to undeveloped land that could be used for industrial development.

Sain Road (SR 1643) - This 20-foot wide two-lane roadway currently carries 1500 vehicles per day. This volume is expected to increase to 3,000 by the year 2020. Existing capacity is 11,000 vehicles per day. No improvements are recommended for the design year.

Minor Thoroughfare System

Minor thoroughfares in the Mocksville Thoroughfare Plan, shown in Figure 4, include Skyline Drive, East Lake Drive, Ridgeview Drive, Depot Street and Salisbury Street.

Skyline Drive - This proposed minor thoroughfare will provide access from Bethel Church Road to industrial property located along the proposed extension of John Crotts Road (SR 1602).

East Lake Street - This facility provides access from US 64 to a residential area. It is proposed that East Lake Street be extended south to Eaton Street, providing access to the south side of Mocksville for local traffic.

Salisbury Street - This minor thoroughfare functions as a crosstown facility connecting Sanford Avenue to Hardison Street and US 601 and is adequate for future traffic demands.

Depot Street - Depot Street connects Main Street with Lexington Avenue and provides access to Mocksville's central business district from the east side of Town. This two-lane road is adequate for design year traffic and no improvements are recommended during the planning period.

Ridgeview Drive - This minor thoroughfare connects Wilkesboro Street with Valley Road. It is proposed that it be extended to Sanford Avenue creating an eastside crosstown facility for local traffic.

Environmental Concerns

The importance of the environment is becoming increasingly apparent and there is a need to make every effort to preserve it. In looking at proposed thoroughfares it is desirable to locate a corridor that will do the least amount of damage to the environment. Environmental factors usually considered in highway project evaluation can be divided into three major categories--physical, social and/or cultural, and economic environmental considerations (Table 4). Many of these are accounted for when a project is evaluated with respect to user benefits, cost and economic development potential. However, thirteen environmental factors are generally not considered in these evaluations. They are the environmental impacts of a project on (1) air quality (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) park and recreational facilities, (11) historic sites and landmarks, (12) public health and safety, and (13) aesthetics. The summation of both positive and negative impacts probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

TABLE 4

Environmental Considerations		
Physical Environment	**Social and/or Cultural Environment**	**Economic Environment**
Air Quality	Housing	Businesses
Water Resources	Neighborhoods	Employment
Wildlife	Noise	Economic Development
Vegetation	Education Facilities	Public Utilities
	Churches	Transportation Costs
	Park and Recreational Facilities	Capital Costs
	Public Health and Safety	Operation and Maintenance Costs
	Aesthetics	

Listed below are impacts associated with various sections of the recommended thoroughfare plan:

- The extension of Bethel Church Road to Campbell Street (SR 1400) to US 601 will cause both positive and negative impacts. The positive impact is due to two factors. First, the proposed roadway will reduce travel time and should provide a safer environment for motorists. Second, the roadway should stimulate industrial growth in the area of Bethel Church Road. The negative impact is due to the displacement and relocation of some houses and trailers along Little Korea Road (SR 1402).

- The construction of the US 601 Bypass also has both positive and negative impacts. The positive impact is that the bypass will reduce congestion in the downtown area. This will lower carbon monoxide levels improving air quality. The negative impact is that the proposed route will cross five small streams. Careful planning will be required to avoid degradation of these streams.

Construction Improvements and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The potential cost estimate of four Mocksville projects are given in Table 5. The evaluation of these projects with respect to user benefits, probability that economic development will be stimulated and environmental impact is given in Table 6.

Thoroughfare improvement needs identified and evaluated in the Mocksville Thoroughfare Plan are:

- The extension of Bethel Church Road north from its intersection with Milling Road, merging with Campbell Road, crossing County Lane and continuing north to US 601.

- The extension of Bethel Church Road to the south across SR 1602 intersecting with US 64.

- The extension of the east end of Eaton Street to intersect opposite the southern extension of Bethel Church Road.

- The relocation of the west end of Eaton Street to approximately 0.25 miles south of its existing intersection with US 601.

- A US 601 Bypass on the west side of Town that will form a crosstown loop facility for local traffic and remove through traffic from the Mocksville central business district.

- Realigning of Salisbury Street with South Main Street.

- Extend East Lake Drive to intersect with Eaton Street.

- Extend Ridgeview Drive to intersect with Sanford Avenue.

TABLE 5

Potential Project Cost Estimates Investigated Projects		
Project	**Project Description**	**Total Cost**
1	Bethel Church Rd. Ext. to US 601	$2,930,000
2	US 601 Bypass	$4,570,000
3	Bethel Church Rd. Ext. to US 64	$ 300,000
4	Eaton Street Ext. to US 64	$1,550,000

TABLE 6

Benefits Evaluation for Investigated Projects						
Project	Benefits (1000's)	Costs (1000's)	Length Mile	Benefits per Mile	Econ. Dev. Potential	Eviron. Impact
BETHEL CH.- US 601	$27,880	$2,930	2.4	$11,616	1.00	+0.8 -0.2
US 601 BYPASS	$8,320	$4,570	4.3	$1,935	0.50	+0.4 -0.2
BETHEL CH.- US 64	$ 560	$ 300	0.3	$1,866	0.75	+0.2 -0.1
EATON ST. - US 64	$7,654	$1,550	1.3	$5,887	0.25	+0.2 -0.1

VI. IMPLEMENTATION

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a thoroughfare plan, the plan may be adopted by the governing body of the municipality and the Department of Transportation to serve as the basis for future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways. Facilities which are designated a municipal responsibility will be constructed and maintained by the municipality.

After mutual plan adoption, the Department of Transportation will initiate negotiations leading to determining which of the existing and proposed thoroughfares will be a department responsibility and which will be a municipal responsibility. Chapter 136, Article 3a, Section 136-66.1 of the General Statues provides guidance in the delineation of responsibilities. In summary, these statutes provide that the Department of Transportation shall be responsible for those facilities which serve volumes of through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality. The municipality is responsible for those facilities which serve primarily internal travel.

Thoroughfare plan adoption enables other planning tools such as the subdivision ordinance, zoning ordinance, official street map, and capital improvement program to be used to assist in plan implementation and thus minimize public cost and land use disruption.

FUNDING SOURCES AND METHODS RECOMMENDED FOR IMPLEMENTATION OF PROJECTS									
PROJECT	Funding Sources				Methods of Implementation				
	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Development Review
Bethel Church Rd. - US 601		X			X				X
US 601 Bypass		X			X	X	X		X
Bethel Church Rd. - US 64	X			X	X	X			
Eaton St. - US 64		X			X	X			X
Realignment of S. Salisbury St. with S. Main St.	X			X	X		X		X

Methods Used to Protect Adopted Thoroughfare Plan

Subdivision Controls

A subdivision ordinance requires that every subdivider submit to the Town Planning Commission a plot of his or her proposed subdivision. Certain standards must be met by the developer before he or she can be issued a building permit to construct the development. Through this process, it is possible to reserve or protect the necessary right-of-way for proposed streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan.

Since many of the proposed thoroughfares are outside the existing Mocksville City Limits, is recommended that additional building setbacks and/or right-of-way reservation conforming to the Thoroughfare Plan also be applied in the Davie County Thoroughfare Plan. This will allow for orderly implementation of the plan in Mocksville fringe areas without disrupting adjoining land owners.

Zoning

A zoning ordinance can be beneficial to thoroughfare planning by designating appropriate locations of various land use and allowable densities of residential development. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares and (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Future Street Lines Ordinance

This ordinance is a particular benefit where widening of a street will be necessary at sometime in the future. A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. Through a metes-and-bounds description of a street's future right-of-way requirements, the City may prohibit new construction or reconstruction of structures within the future right-of-way. This approach requires specific design of the facility and would usually require surveys and public hearings to allow affected property owners to know what to expect and to make necessary adjustments without undue hardship. A specific ordinance can be enacted for selected streets.

Development Reviews

Often the municipality is the first point of contact for development interest. Any development that may impact a State maintained street or highway must be reviewed by the Department of Transportation. For example, driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and the Traffic Engineering Branch of the Department of Transportation prior to access being allowed. If this is done at an early stage it is often possible to improve significantly the development's accessibility at minimal expense. In the case of thoroughfare planning, if a shopping center or industry is going to locate in the path of a proposed roadway the review process may provide an opportunity to modify the site to allow for the future roadway.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." For cities contemplating the adoption of a Roadway Corridor Map, more commonly referred to as an Official Street Map, there are several things to consider prior to implementation. First and foremost, it should be recognized that an Official Street Map designation places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition for a period of up to three years on the issuance of building permits or the approval of subdivisions of property lying within an Official Street Map corridor. This authority should be used carefully and only in cases where less restrictive powers will be ineffective. The Proposed Charlotte Outer Loop is an example of a facility that could be protected by using an Official Street Map.

The statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the statute, a project being considered for an Official Street Map must be programed in the State's Transportation Improvement Program (TIP) or included in a locally adopted Capital Improvements Program in addition to appearing on the adopted street system plan. The Statute states that the Capital Improvements Program must be for a period of ten years or less and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map Projects should contact this branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

NC Department of Transportation
Program and Policy Branch
Post Office Box 25210
Raleigh, NC 27611

Funding Sources

Capital Improvements Program

A capital improvement program makes it easier to build a planned thoroughfare system. This capital improvement program consists of two lists of projects. The first is a list of highway projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list of local projects designated as State responsibility to be included in the Transportation Improvement Program.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programed projects are advanced, and new projects are added.

During annual TIP public hearings, municipalities request projects such as the extension of Bethel Church Road to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an Industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $150,000 per year per project. A Town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process".

2. Enact a bond issue to fund street improvements.

3. Consider the possibility of specific projects qualifying for federal demonstration projects funds.

4. Adopt a collector street plan that would assess buyer or property owners for street improvement.

5. Charge a special assessment for utilities; for example increase water and sewer bills to cover the cost of street improvements.

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APPENDIX A
LEVEL OF SERVICE DEFINITIONS

A good indication of the adequacy of the exiting major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled principally by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

Capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given relationship of traffic volumes to the capacity of the roadway will determine level of service being provided. Six levels of service have been selected to identify the conditions existing under various speed and volume conditions on a highway or street. The six levels of service, as shown in Figure 5, are:

1. Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

2. Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

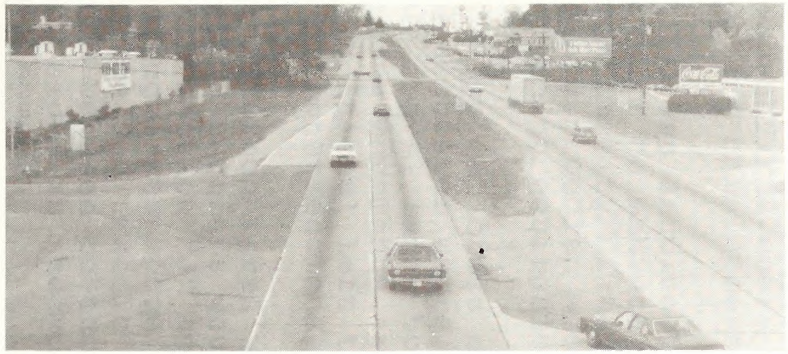
3. Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic steam will cause breakdowns. Maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

4. Level-of-service D represents high-density, but stable flow. Speed and freedom to maneuver are severely restricted. The driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

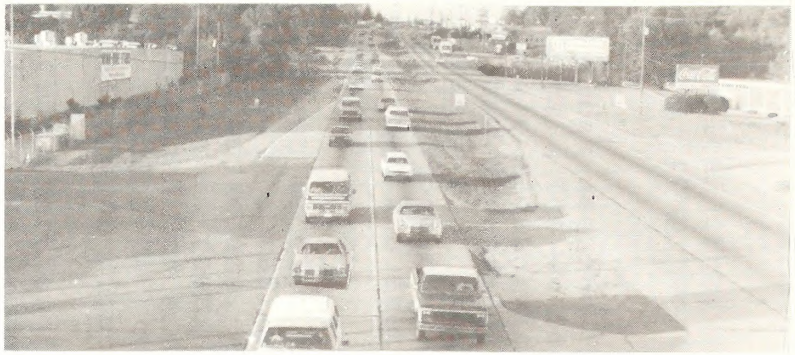
5. Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Maneuver within the traffic stream is extremely difficult, an it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers.

6. Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues from behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. In many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. It is the point at which arrival flow exceeds discharge flow which causes the queue to form. Level-of-service F is an appropriate designation for such points.

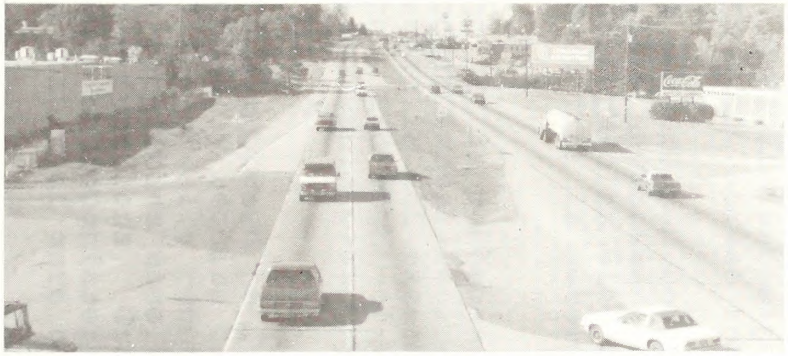
The recommended improvements and overall design of the Thoroughfare Plan were based on achieving a minimum of LOS D on existing facilities, and LOS C on new facilities. LOS D is considered the "practical capacity" of a facility, or that at which the public begins to express dissatisfaction.



LEVEL OF SERVICE - A

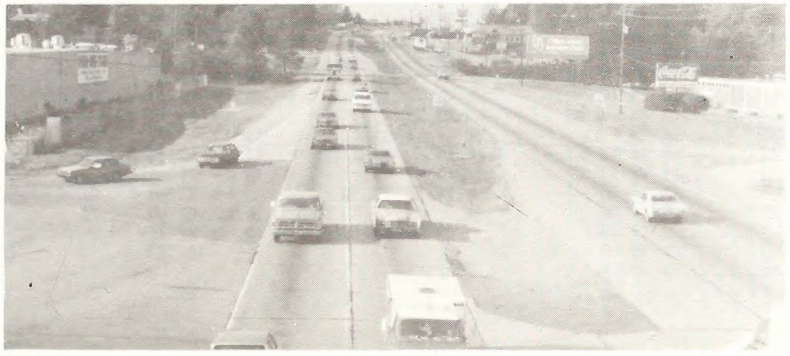


LEVEL OF SERVICE - D



LEVEL OF SERVICE - B

LEVEL OF SERVICE - E



LEVEL OF SERVICE - C

LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 5

APPENDIX B
TYPICAL CROSS SECTIONS

Typical cross sections recommended by the Statewide Planning Group are shown in the following diagrams of Figure 6.

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns are anticipated as a result of abutting development or frequent street intersections.

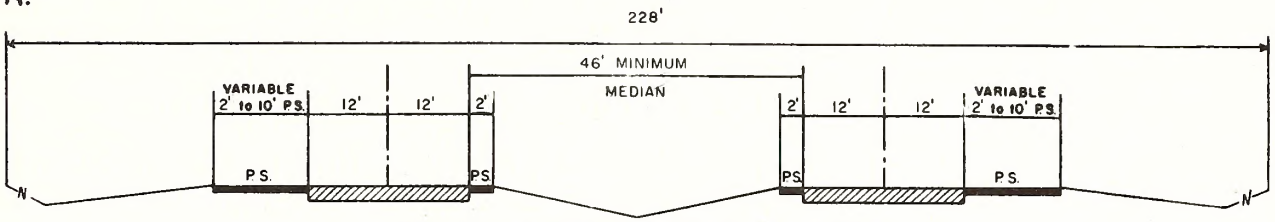
Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares were parking on both sides is needed as a result of more concentrated development.

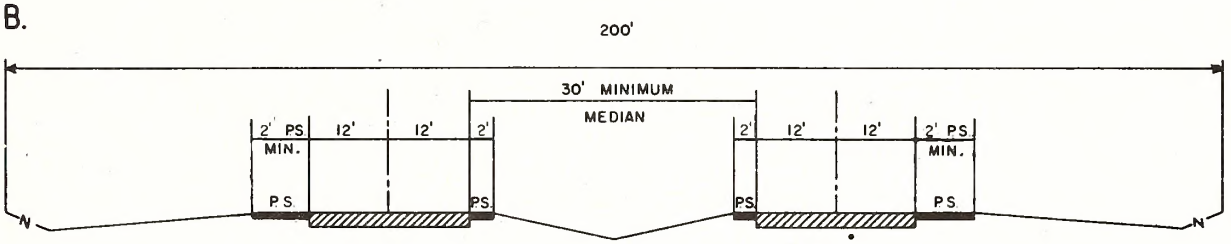
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



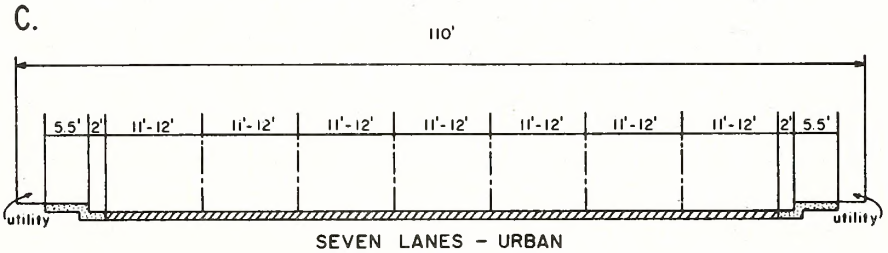
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



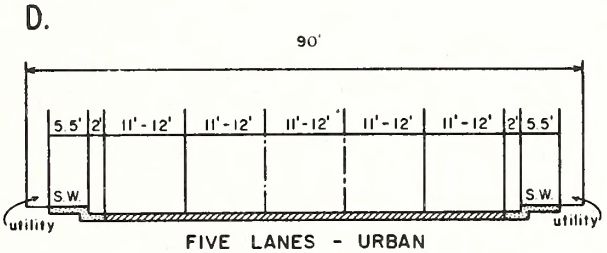
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



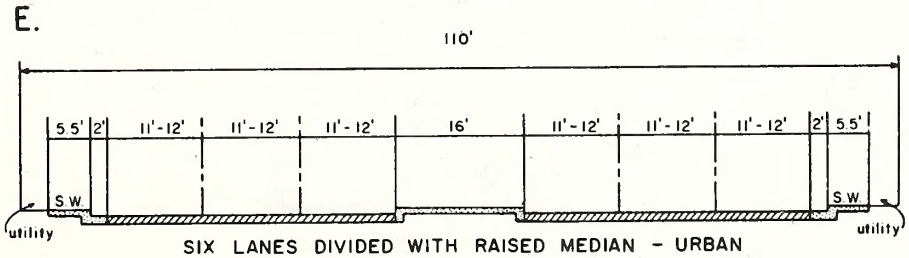
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

E.

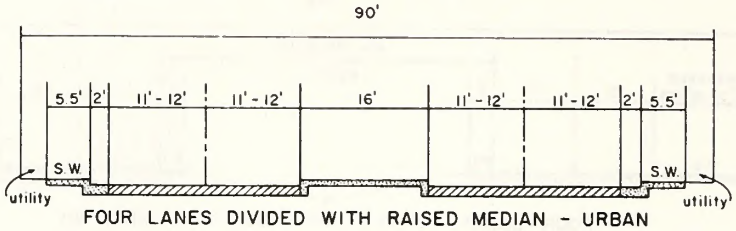


SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

FIGURE 6

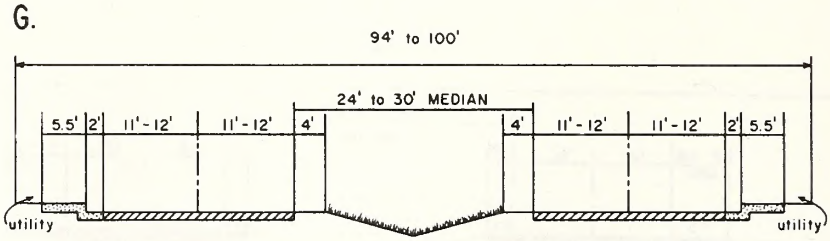
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



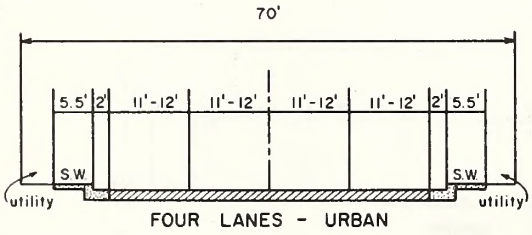
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



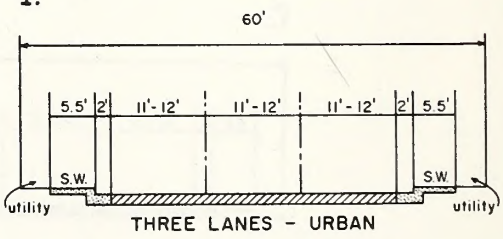
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



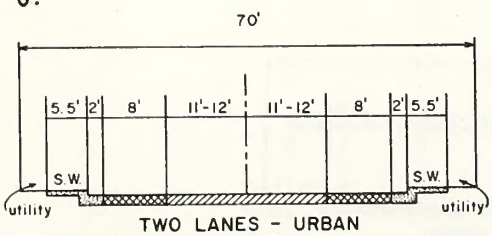
FOUR LANES - URBAN

I.



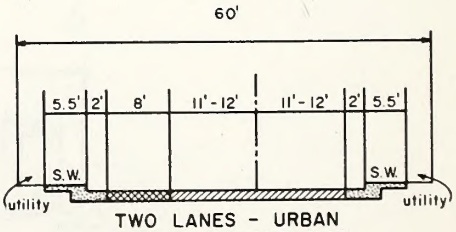
THREE LANES - URBAN

J.



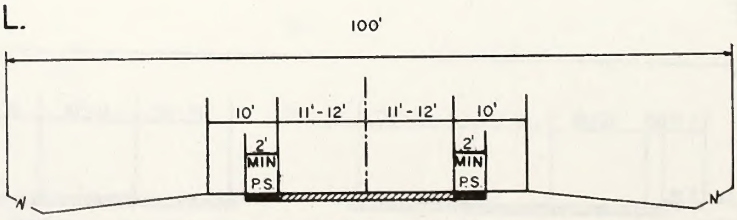
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



TWO LANES - RURAL

Cross section "L" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter urban cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk an the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

Right-of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

APPENDIX C - THOROUGHFARE PLAN STREET TABULATIONS AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X-SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1991 ADT	2020 ADT	RECOMMENDED X-SECTION RDWY (ULT)	ROW (ULT)
US 601								
I-40 - Koontz Rd.	0.38	60	NA	35,600	15,600	36,200	ADQ	ADQ
Koontz Rd.- Valley Rd.	0.85	48	NA	33,500	12,200	24,000	ADQ	ADQ
Valley Rd - Lexington St.	1.32	24	60	12,000	6,500	12,000	ADQ	ADQ
Lexington St. - Eaton St.	0.85	24	60	12,000	8,100	11,800	ADQ	ADQ
Eaton St. - SR 1165	0.76	36	60	20,300	15,000	25,000	ADQ	ADQ
Country Lane/SR 1400								
US 601 - US 158	2.14	24	NA	13,000	3,200	6,400	ADQ	ADQ
Campbell St. (SR 1400)								
SR 1461 - SR 1402	0.76	24	60	12,500	2,400	6,500	L	ADQ
SR 1402 - N. Main St.	0.38	24	--	(12,500)	---	6,400	L	100
SR 1461 - SR 1404	1.19	24	--	(12,500)	---	6,500	L	100
US 158								
Gaithers St. - Milling Rd.	0.85	24	60	12,500	11,000	9,000	ADQ	ADQ
Milling Rd. - SR 1643	1.52	24	60	12,500	7,500	9,500	ADQ	ADQ
Milling Road (SR 1600)								
N. Main St. - Bethel Ch. Rd.	0.80	24	60	12,500	4,400	7,300	I	60
(Town widening)		(36)	NA	(16,000)				
Bethel Ch. Rd. - SR 1643	1.90	24	60	12,500	2,000	3,200	ADQ	ADQ
Bethel Church Rd. (SR 1601)								
Milling Rd.- Bethel Church	0.47	24	60	12,500	2,400	6,100	ADQ	ADQ
Bethel Church - US 64	0.47	24	--	(12,500)	---	6,100	L	100
Milling Rd - N. Main St.	0.76	24	--	(12,500)	---	4,300	L	100

ADQ - ADEQUATE
NA - NOT AVAILABLE

FACILITY & SECTION	EXISTING X-SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1991 ADT	2020 ADT	RECOMMENDED X-SECTION RDWY (ULT)	ROW (ULT)
Sain Road (SR 1643)								
US 158 - SR 1600	1.90	20	NA	11,000	1,500	3,000	ADQ	ADQ
US 64								
Salisbury St.- SR 1602	2.84	24	60	12,500	7,200	12,800	ADQ	ADQ
Lexington Ave.- Valley Rd.	1.23	24	60	12,000	10,700	12,000	ADQ	ADQ
Valley Rd - SR 1116	2.03	24	60	12,500	4,100	7,000	ADQ	ADQ
SR 1602								
US 64 - Bethel Ch. Rd.	1.40	24	NA	12,500	1,100	2,200	ADQ	ADQ
Extension from Bethel - Milling	1.17	24	--	(12,500)	---	3,000	L	100
Milling - Bethel Extension	0.21	24	--	(12,500)	---	1,000	L	100
Eaton St.								
Extension Eaton - US 64	0.57	24	--	(12,500)	---	4,300	L	100
West End Exist Eaton - Lake Dr. Ext.	0.68	24	--	9,000	80	4,300	L	100
Lake Dr. Ext. - US 601	0.49	24	--	(12,500)	---	4,300	L	100
Salisbury St.								
Sanford Ave. - Hardison St.	0.49	24	NA	12,500	3,000	5,400	ADQ	ADQ
Hardison St. - Clay St.	0.28	24	NA	12,500	4,100	6,200	ADQ	ADQ
Relocation of Intersection with S. Main St.	0.02	24	NA	(12,500)	4,100	6,200	L	100
Gaithers St. - Hardison St.	0.63	24	NA	12,500	10,500	12,500	ADQ	ADQ
Hardison St.								
Salisbury St. - SR 1160	1.95	24	NA	12,500	7,600	11,700	ADQ	ADQ

ADQ - ADQUATE
NA - NOT AVAILABLE

FACILITY & SECTION	EXISTING X-SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1991 ADT	2020 ADT	RECOMMENDED X-SECTION RDWY (ULT)	ROW (ULT)
Sanford Ave.								
Salisbury St. - SR 1141	1.75	24	NA	12,500	2,400	5,500	ADQ	ADQ
Valley Road								
US 601 - Sanford Ave.	1.14	36	NA	21,400	5,500	11,000	ADQ	ADQ
East Lake Drive								
US 64 - City Limits	0.37	18	NA	9,000	800	1,600	ADQ	ADQ
City Limits - Eaton St.	0.32	24	--	(12,500)	---	1,000	J	70
Ridgeview Drive								
Wilkesboro St. - Valley Rd.	0.42	20	NA	11,000	1,000	2,000	ADQ	ADQ
Ext. Valley Rd. - Sanford Ave.	0.47	24	--	(12,500)	---	2,000	J	70
Depot Street								
S. Main St. - Lexington Ave.	0.51	24	NA	12,500	4,000	6,200	ADQ	ADQ
US 601 Bypass								
US 601 - US 64	1.19	48	--	(37,700)	---	18,435	C	200
US 64 - Sanford Ave.	1.00	48	--	(37,700)	---	18,478	C	200
Sanford Ave. - Hardison St.	1.02	48	--	(37,700)	---	18,300	C	200
Hardison St. - US 601	0.97	48	--	(37,700)	---	17,600	C	200

ADQ - ADEQUATE
NA - NOT AVAILABLE

APPENDIX D
RECOMMENDED SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - a road which serves major intra-county travel corridors and traffic generators and provides access to the arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector System.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares preform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through-traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway - Divided multilane highway designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. (Design speed 70 mph, Operating speed 55 to 65 mph)

2. Secondary Freeway - A divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. The facility provides for the continuous flow of traffic thorough full control of access and the provision of interchanges or grade separation with no access at cross roads, and no traffic signals. (Design speed 50-55 mph, Operating speed 40-45 mph)

3. Parkway - A divided multilane roadway designed for noncommercial traffic, with full or partial control of access. Grade separations are provided at major intersections and there are no traffic signals.

4. Expressway - A divided multilane roadway designed to carry heavy volumes of traffic with full or partial control of access. Interchanges are provided at major intersections. There may be access to service roads and local streets, but there will be no signalized intersections.

5. Secondary Expressway - A divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. This facility may have partial control of access with right turn in and right turn out access to abutting property, and interchanges at major intersections. Some minor intersections may have traffic signal control.

6. Urban Arterial - Multilane roadway with signalized intersections, and access to abutting property. May have grass or barrier type median, or middle left turn lane.

7. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

8. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic collectors, and do not collect traffic from more than 100 dwelling units.

9. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

10. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

11. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development of or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm corporation or official agent thereof, who subdivides of develops any land deemed to be subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres were no street right-of-way dedication is involved, (3) widening of opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-or-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within Mocksville shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the town of Mocksville.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

	Min. ROW
1. Rural	
a. Principle Arterial	
Freeways	350 ft.
Other	200 ft.
b. Minor Arterial	100 ft.
c. Major Collector	100 ft.
d. Minor Collector	80 ft.
e. Local Road	60 ft.*
2. Urban	
a. Major Thoroughfare other than Freeway and Expressway	90 ft.
b. Minor Thoroughfare	70 ft.
c. Local Street	60 ft.*
d. Cal-de-sec	Variable**

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than sixty feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. when the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

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* The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

** The ROW dimension will depend on radius used for vehicular turnaround. Distance from edge of pavement of turnaround to ROW should not be less than distance from edge of pavement to ROW on street approaching turnaround.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 34 feet, face to face of curb Shoulder section: 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for various facilities shall be:

DESIGN SPEEDS			
Facility Type	Design Speed		
	Desirable	Minimum	
		Level	Rolling
RURAL			
Minor Collector Roads	60	50	40
Local roads including Residential Collectors and Local Residential	50	50*	40*
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	50
Minor Thoroughfares	60	50	40
Local Thoroughfares	40	40**	30**

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* Based on projected annual average daily traffic of 400-750. In cases where road will serve a limited area and small number of dwelling units, minimum design speeds can be reduced further.

** Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE		
Design Speed	Terrain	
	Level	Rolling
60	4	5
50	5	6
40	6	7
30		9

b. Minimum grade should not be less than 0.5%.

c. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

d. For streets and roads with projected annual average daily traffic less than 250 vehicles and grades less than 500 feet long, values may be 150% of that shown in the above table.

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE				
Design Speed	30	40	50	60
Stopping Sight Distance				
Minimum (ft.)	200	275	400	525
Desirable Minimum (ft.)	200	325	475	650
Minimum K* Value for:				
Crest curve	30	80	160	310
Sag curve	40	70	110	160

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide the desired sight distance.

Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter of 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE			
Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,528	3 45′
30	0.06	273	21 00′
40	0.06	509	11 15′
50	0.06	849	6 45′
60	0.06	1,380	4 15′
30	0.08	252	22 45′
40	0.08	468	12 15′
50	0.08	764	7 30′
60	0.08	1,206	4 45′

e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than seven hundred (500) feet in length (for control of speed, visual detection of a dead end street, and for fire protection). The distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to right-of-

way line on the street approaching the turnaround. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purpose accept that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.

3. Deadend alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the deadend as may be required by the Planning Board.

G. Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder section approach

i. Under 800 ADT design year

Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

ii. 800 - 2000 ADT design year

Minimum 34 feet width face to face of parapets of rails or pavement width plus 12 feet, whichever is greater.

iii. Over 2000 ADT design year

Minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails.

b. Curbs and gutter approach

i. Under 800 ADT design year

Minimum 24 feet face to face of curbs.

ii. Over 800 ADT design year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

a. Shoulder section approach - Width of approach pavement plus width of useable shoulders on the approach left and right. (Shoulder width 8' minimum, 10' desirable.)

b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.